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# Audit of Water Management in Norns and Springer Creek Community Watersheds

Forest Practices Board

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# NEWS release

**For Immediate Release**
**August 9, 2006**

## Board Finds Good Forest Practices in Two Community Watersheds

VICTORIA – A pilot audit of two community watersheds in the Arrow Boundary Forest District has determined that forest practices are in compliance with legislated requirements in all significant respects, the Forest Practices Board reported today.

"The board determined that current forest practices are effective at minimizing impacts to water quality," said acting board chair Geoff Battersby. "I am pleased to see that licensees are managing their forestry practices in ways that do not damage water supplies."

The pilot audit examined forest practices carried out by four licensees during the course of operations in the Norns Creek community watershed near Castlegar and the Springer Creek community watershed near Slocan. The licensees audited were Atco Lumber Ltd., Kalesnikoff Lumber Co. Ltd., Pope & Talbot Ltd. and Springer Creek Forest Products Ltd.

The pilot audit assessed licensee performance using criteria and assessment methods developed by the board and the Ministry of Forests and Range. The criteria address water quality, quantity and timing of flow, as well as licensees' planning, monitoring and risk management processes.

The Forest Practices Board is an independent public watchdog that reports to the public about compliance with the Forest and Range Practices Act (FRPA) and the achievement of its intent. The board's main roles under FRPA are:

- Auditing forest practices of government and licence holders on public lands.
- Auditing government enforcement of FRPA.
- Investigating public complaints.
- Undertaking special investigations of forestry issues.
- Participating in administrative appeals.
- Providing reports on board activities, findings and recommendations.

-30-

**This news release and more information about the board are available on the Forest Practices Board Web site at www.fpb.gov.bc.ca or by contacting:**

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# Preface

## Pilot Effectiveness Audits

*The 2004 Forest and Range Practices Act (FRPA) shifts forest practices legislation from a prescriptive to a results-based approach. FRPA establishes objectives for various forest values, and requires licensees to develop forest stewardship plans that set out strategies or results consistent with these objectives.*

*Provincially, there is considerable work underway through various initiatives, such as the FRPA Resource Evaluation Working Group, towards interpreting and explaining FRPA's objectives in a way that can be understood and put into practice. The Board considers the development and application of criteria and indicators an appropriate means to address this challenge.*

*The Board anticipates applying criteria and indicators to facilitate results-based assessments of forest practices, and to explain audit findings in a way that can be understood by the general public and by forestry professionals. Pilot effectiveness audits are a key part of the process.*

*The main purpose of the pilot effectiveness audits is not just to determine compliance, but rather to work with auditees and government agencies to develop criteria and indicators that will help to assess effectiveness of forest practices on the ground.*

*In 2004, the Board published pilot effectiveness audits for soils and riparian values. In 2005, a pilot visuals audit and a second pilot riparian audit were released. A test of tools for auditing biodiversity was released in early 2006.*

*The experience gained from the pilot audits will be used to further the Board's approach under FRPA, so that future audits can provide assurance about the results of forest practices in relation to government's forest management objectives. The Board will also use these audit results to help develop effectiveness criteria and indicators for all FRPA forest values.*

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# Executive Summary

This is the Board's audit report on water management in the Norns and Springer Creek community watersheds in the Arrow Boundary Forest District. This is one of several pilot audits[1] designed to assess forest practices in relation to key values established by government under the *Forest and Range Practices Act* (FRPA). Through these pilot audits, the Board is continuing to test methodologies to assess results of forest practices in relation to government objectives.

Like the previous pilot audits, this audit applied a set of criteria to facilitate results-based assessments and report the audit findings in a way that is useful to both the general public and forestry professionals.

The Board developed the criteria to enable an assessment of forest practices, and the results of those practices, as they relate to water quality. Practices were examined to determine if they were effective in minimizing impacts to water quality, quantity and timing of flow. The criteria also address the necessary elements of licensees' management systems, such as planning and monitoring, which would contribute to successful results. This includes assessing licensees' awareness of water supply systems and erosion risk in the community watersheds, and their management of those risks.

An assessment of the effectiveness of the water quality framework necessarily includes consideration of aspects of the roles, responsibilities and performance of other participants in the management of water: water users, water suppliers and government agencies. Certain criteria therefore address the practices and performance of these participants, even though they are not formal auditees under the Board's mandate.

The audit assessed the following main criteria:

- Adequate background information has been collected to plan watershed activities.
- Responsibilities of the various participants in the matter of water quality and quantity in the community watershed have been delineated and are understood; the objectives and expectations for water quality have been established; and there is a reasonable level of communication among water suppliers, licensees and government agencies.
- Plans and strategies address potential water quality and quantity impacts.
- Practices on forest land within watersheds are effective in minimizing impacts to water quantity, quality and timing of flow.
- Licensees, water providers and government agencies monitor to ascertain that water quality and quantity are maintained.
- Forest and range practices have not materially affected water quality, quantity or timing of flow at the intake.

## Audit Results

The results of this audit show that auditees conducted forest practices substantially in compliance with water management requirements of the Forest Practices Code[iii] (the Code) and are effective in managing water resources.

The audit found that licensees have sufficient knowledge of the legislation and expectations for their performance. To date the *Drinking Water Protection Act* (DWPA)has not added specific requirements beyond those existing under the Code, and so licensees focus on what they can control—their practices.

On the whole, forest practices were effective in minimizing impacts to water quality. The audit identified only a few instances where improvement was warranted in the management of ditchline water and revegetation, practices that were both generally conducted well.

This result was supported by the audit's water sampling results, which showed very little evidence of water quality impacts associated with forestry activity. In both watersheds, samples taken from above the water intakes and, therefore, prior to treatment, met Canadian drinking water guidelines for turbidity in treated water at the time of sampling. Our measurements were taken during a significant rainfall event in which natural turbidity levels would be expected to be elevated. This result reflects well on the forest practices conducted in the watersheds.

Licensees' forest activities were adequately planned and monitored, and licensee communication with users was largely effective, even though their notification of road activity did not entirely meet legislated requirements. In the Norns watershed, licensees communicated with those they considered most likely to be affected by any adverse impacts of forest activity, but not all affected[iv] water suppliers and water licensees were notified of imminent road construction in accordance with legal requirements.

The responsibilities of the government agencies and water suppliers are fairly clear, but recent legislative and policy changes have created some challenges:

- Government agencies have withdrawn from their previous leadership role in coordinating the management of water, and do not become involved in most water management activities, except when responding to problems. More responsibility is on water suppliers and licensees to work things out between themselves.

- Regional health authorities, and specifically the drinking water officers, are now required by DWPA to be involved in the regulation of activity relating to source water above the water intake. Although they do not directly regulate forest activities, they may need to make orders to protect water where upland activities are creating a drinking water health hazard. The health authorities are still developing the framework for how they will deal with these new responsibilities and are working with the land-based ministries to

establish a memorandum of understanding that will clarify responsibilities, for managing source water protection.

Government still has work to do to effectively implement its water management framework.

## Board Commentary

The Board considers it timely to reflect on the audit results and approach with respect to their implications for future Board work.

As a cautionary note, it is important that these audit results not be interpreted more widely than appropriate. The audit examined two unique watersheds using a pilot criteria set. The characteristics and development history of watersheds can vary significantly so the Board would expect audit results to vary as well.

The key finding—that forest practices on the whole were effective in minimizing impacts to water quality—is primarily about turbidity. There are other factors that can affect drinking water quality, including organic and fecal material, and metals. In the Norns watershed, the risk to water quality is greater from material input from private land. The Robson Raspberry Improvement District confirmed that it was more concerned about water quality impacts from activity on private land than from forestry activity.

This pilot audit was quite comprehensive, employing a number of assessment methods: overview assessments of erosion hazards in the two watersheds; examination of practices; measurement of actual and potential erosion at individual sites; and sampling of water quality. The approach recognizes that the main risk related to forestry activity is turbidity caused by road construction, maintenance and deactivation, particularly around stream crossings and other areas with connectivity to water courses.

Since this is a pilot audit, the Board sought input from participants concerning the audit methodology and the criteria developed for it. The Board will develop future audits of water management in consideration of this input; for instance, a future revision of the criteria will more fully address landscape level issues, such as fuel management (fire hazard) and forest health in watersheds. The Board will continue to use experience gained from these pilot audits to further its audit approach under FRPA, so that future Board audits can provide assurance about the results of forest practices in relation to government's forest management objectives.

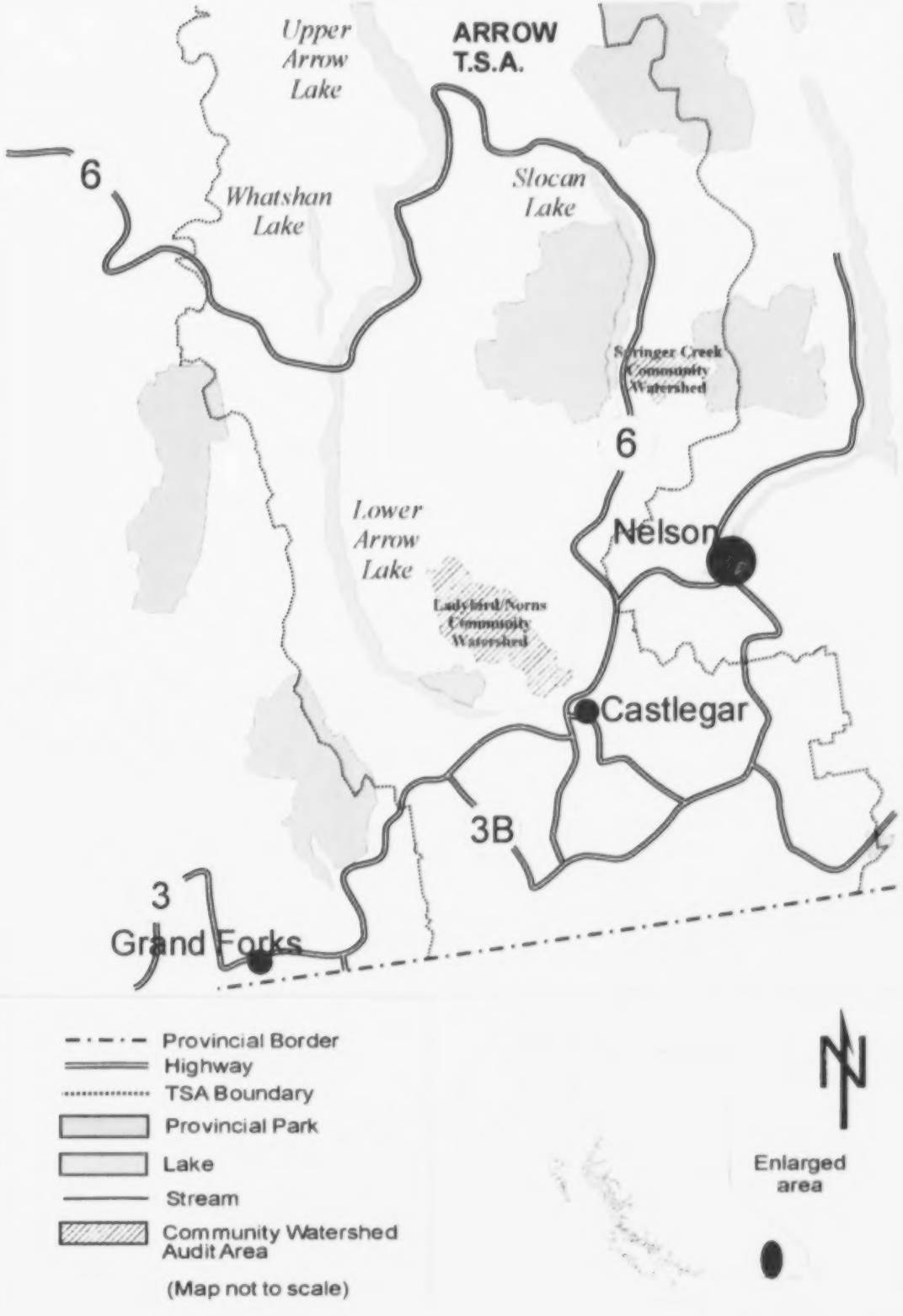
Appendix C contains a summary of comments received from participants regarding the audit and the draft report.

## Recommendation

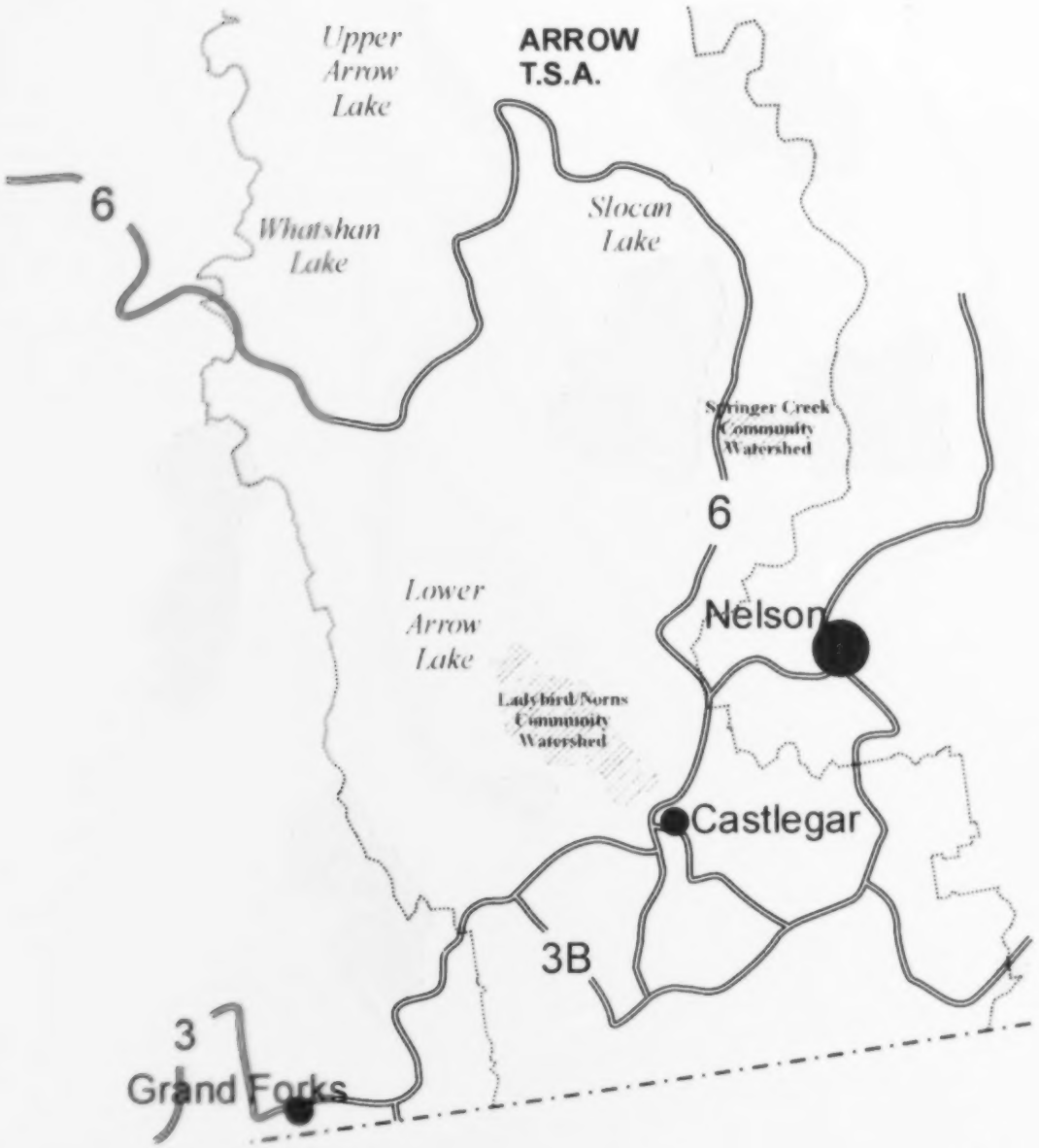
The audit identified a discrepancy between the legislated requirement to notify water providers in advance of road works and government's apparent intent when creating that legislation. According to Ministry of Forests and Range (MOFR) staff, the notification requirement is not intended to apply to individual water licence holders in the watershed, only to the primary community water purveyor. Therefore, as provided by section 131 of FRPA, the Board recommends that MOFR reassess the present requirement for notification in section 84 of the *Forest Planning and Practices Regulation*, to ensure that it accurately specifies only those intended to be notified.

The Board will continue to examine licensee compliance with the requirement to notify in future audits.

## Water Quality Audit



## Water Quality Audit



# Introduction

Water is one of British Columbia's most important natural resources and is 1 of 11 resource values specifically identified in the *Forest and Range Practices Act* (FRPA).

## Legislation

In relation to forest practices, FRPA, and its associated regulations, are the primary legislation for source drinking water protection on Crown land in British Columbia. FRPA requirements become legally binding once a forest stewardship plan (FSP) is approved. Transitional provisions of FRPA dictate that planning activities and on-the-ground operations under a forest development plan continue to be governed by the Forest Practices Code (the Code), which is the case in this audit, since no audited forest activities were undertaken under FSPs.

Government objectives for water quality under FRPA cover two main aspects: requirements for riparian areas, and for community watersheds. For riparian areas, government's objectives are simply to conserve water quality at the landscape level. In community watersheds, government's objective for water being used for human consumption is to prevent the cumulative effects of forest activities from resulting in:

- a material adverse impact on the quantity of water or the timing of the flow of the water; or
- the water from the waterworks having a material adverse impact on human health that cannot be addressed by water treatment.

In both cases, government's objectives for water apply only to the extent that they do not unduly reduce the supply of timber from British Columbia's forests. Although these government objectives for water were not formally in place during the audit, they were considered within the evaluation of the effectiveness criteria.

The *Drinking Water Protection Act* (DWPA) is the primary legislation designed to directly protect the province's drinking water. Its key elements include:

- Numerous obligations imposed on water suppliers[iv], including requirements to provide potable water, monitor water quality and have written emergency response and contingency plans.
- Establishment of drinking water officers in the regional health authorities as statutory decision makers with wide ranging powers, including the ability to require source to tap assessments of water supply systems and preparation of drinking water protection plans.

- Prohibitions on people who are not water suppliers, including forest agreement holders and private land owners, from doing things that are likely to result in a drinking water health hazard. These prohibitions apply to areas both within and outside community watersheds.

The *Water Act* and its regulations also have provisions relevant to water management. In particular, the *Water Act* regulates works in and about a stream, including streams passing through private land. Advance notification and approval is required for any works that might modify the nature of the stream or have an impact on it. Most stream-related operations conducted under approved Code plans do not require additional approvals under the *Water Act*, because they are exempt under a provision of the *Water Regulation*. The *Water Regulation* does not exempt such activities under FRPA, although activities that conform to a set of default prescriptive elements in the regulation are exempt from approval.

## The Audit Area

The Arrow Boundary Forest District was randomly chosen from a group of forest districts with community watersheds that had experienced significant levels of harvesting and road building activities over the previous two years. Within the district, auditors selected two community watersheds for field sampling—Norns Creek and Springer Creek (refer to map on page 5).

### Norns Creek

The Norns Creek watershed (also known as Ladybird-Norns) is 20,200 hectares in size and includes Ladybird, Norns and Matt Creeks, as well as numerous tributaries. The community watershed area is the area that drains into the Robson Raspberry Improvement District (RRID) water intake. The upper portion of the watershed has a long history of forest development with large scale harvesting starting in the late 1960s. In addition, the public uses the area for a variety of recreational pursuits, especially snowmobiling in winter.

Figure 1. Cut block showing a deactivated road in the upper Norns Creek watershed.

There are more than 80 individual domestic water licences along the main channel and in various tributaries within this watershed, as well as several water user communities, including Upper Pass Creek and Spud Hill. The lower reaches of the Norns Creek watershed consist mainly of private land characterized by small-scale farming, ranching and

forest harvesting. As many as 1,000 people live in the watershed and obtain their drinking water from a variety of sources in it. In addition, RRID supplies drinking water to about 1,500 people living outside the watershed.

RRID has been subject to a continuous boil water advisory since 1995. Its water supply system consists mainly of a gravel and mechanical filtration system and ultraviolet light treatment. The water is not chlorinated and the supply system is not fully sterilized, so coliform bacteria can and do inhabit the system. The audit did not examine the other water users' supply systems in the watershed but for the most part they are believed to be simple and do not use chlorine. Boil water advisories have been in place for Spud Hill and Upper Pass Creek water user communities since 1992.

### Springer Creek

The Springer Creek watershed is 4,900 hectares in size. The community watershed area drains into the Village of Slocan's intake, near Highway 6. The village has a consumptive water licence for the watershed but they no longer use the watershed as a source of drinking water. Slocan's drinking water now comes from Gwillam Creek, located in a provincial park on the west side of the Slocan Valley. Slocan's long term plans are to use Springer Creek as a source of water for irrigation and as a backup source for drinking water. There are also two additional domestic water licences within the Springer Creek watershed.

Mineral exploration and development have been ongoing in the watershed for years. Many of the road networks are originally old mining roads and there are several mines in the area, none of which are active. As in Norns Creek, the public uses the Springer Creek watershed for a variety of recreational pursuits, especially snowmobiling in winter.

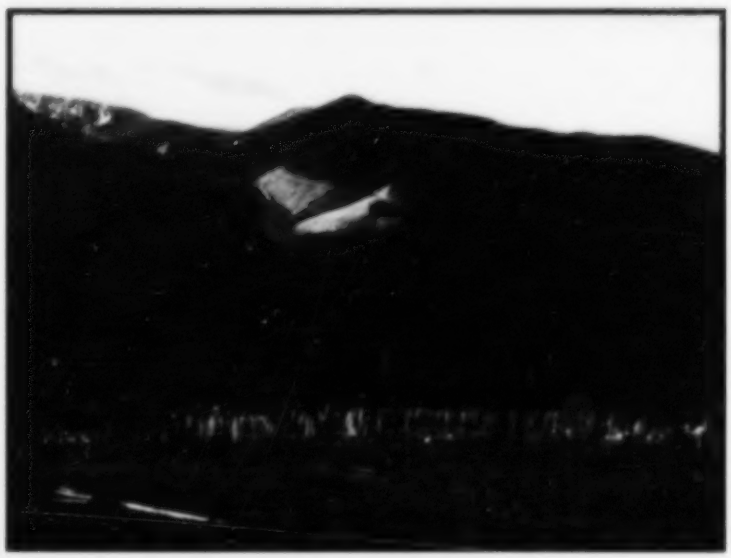


Figure 2. Cutblocks in the upper Springer Creek watershed.

# Audit Scope and Approach

## Audit Scope

### Criteria Development

For this audit, a set of criteria for assessing effectiveness was drafted by the Board and reviewed by staff from the Ministries of Environment, Forests and Range, and Health, as well as the Interior Health Authority, and water users and forest licensees who participated in the audit. The criteria were designed to address the full water management system on Crown land. For example, in addition to performance by licensees in conducting forest practices that minimize impacts to water quality, the criteria were also used to examine roles and responsibilities of government agencies in managing the drinking water resource.

### Audit Area Selection

To identify potential audit areas, the audit team gathered information about recent forest activity in community watersheds from seven forest districts that have two or more large community watersheds. They found that few of the watersheds had experienced significant levels of harvesting and road building over the previous two years. Although this finding was not examined closely, it suggests that the current level of harvesting in community watersheds in the province is actually quite low.

The audit area was randomly selected from the three forest districts containing community watersheds that had significant forest activity. Once the forest district was selected, the audit team reviewed the activity levels in the community watersheds to make the final selection of the ones that would be audited.

### The Auditees

The primary focus of this audit is on forest practices and their effect on water, in the subject watersheds. Therefore, the principal auditees are the forest agreement holders who operated in the watersheds between April 1, 2003, and October 21, 2005. There are four:

- Three major licensees operate in the Norns watershed: Atco Lumber Ltd. (Atco), Kalesnikoff Lumber Co. Ltd. (Kalesnikoff), and Pope & Talbot Ltd. Both Atco and Kalesnikoff conducted harvesting and road and bridge construction and maintenance activities. Pope & Talbot had only road maintenance obligations within the audit area and so were audited just for compliance with those obligations, and not for planning or other forest practices.
- Springer Creek Forest Products Ltd. (Springer Creek) is the only major licensee operating in the Springer Creek watershed. It conducted harvesting and road and bridge construction as well as maintenance activities.

The activities conducted by these four primary auditees during the audit period, are shown in Table 1. In both Norns Creek and Springer Creek, the majority of harvesting and related road construction in this period has been directed at mountain pine beetle infestations.

Table 1. Summary of auditee planning and practices subject to audit:

| Auditee | # of FDPs and amendments | # of cutblocks harvested | km of road constructed / maintained / deactivated | | | # of bridges constructed / maintained | |
|---|---|---|---|---|---|---|---|
| Atco | 3 | 7 | 11.1 | 24.4 | 8.0 | 0 | 3 |
| Kalesnikoff | 1 | 4 | 4.8 | 3.6 | 0 | 3 | 0 |
| Pope & Talbot | 0 | 0 | 0 | 16.0 | 0 | 0 | 2 |
| Springer Creek | 3 | 6 | 8.4 | 43.0 | 0.1 | 0 | 4 |

An assessment of the effectiveness of the water quality framework necessarily includes consideration of aspects of the roles, responsibilities and performance of other participants in the management of water: water users, suppliers and government agencies. Certain criteria therefore address the practices and performance of these participants, even though they are not formal auditees under the Board's mandate.

## Audit Approach

The audit team consisted of: Russ Haas, RPF; Steve Chatwin, PGeo; Clare Vincent, RPF; Jon Davies, CA; and Brian Carson, PGeo.

In undertaking this pilot audit the audit team carried out the following main steps (the Detailed Findings section of this report describes the findings from this work).

### Interviews

Before fieldwork commenced, auditors conducted interviews with agencies, water users and licensees involved in water management. These interviews were the primary source of information about how the government agencies manage water and how the water user groups, in the audit watersheds, manage their responsibilities to supply water. Auditors interviewed representatives of the following organizations:

- The four major licence auditees: Atco, Kalesnikoff, Pope & Talbot and Springer Creek
- Robson Raspberry Improvement District
- Spud Hill water users
- Upper Pass Creek water users
- Village of Slocan
- Interior Health Authority – Nelson
- Ministry of Health – Victoria

- Ministry of Forests and Range – Castlegar
- Ministry of Environment – Nelson

### Overall Watershed Assessment

On October 15, 2005, the audit team conducted reconnaissance watershed assessments on the Norns Creek and Springer Creek watersheds. The purposes of the assessments were to:

- Identify significant sediment sources not associated with audited forestry activities that may affect turbidity at the water intake.
- Assess the rate-of-cut in the watershed that may affect water yield and peak flows.
- Examine riparian impacts not associated with audited forestry activities that may have an effect on sediment yield and water temperature.
- Assess landslide activity not associated with audited forestry activities that could introduce periodic sediment or destabilize stream channels.
- Assess stream channel stability.

The field assessment built on previous similar assessments within these watersheds and was limited to helicopter overview flights of all tributary and main streams in the watershed and around all significant sediment sources, including landslides.

### Compliance Assessment of Planning and Practices

The audit assessed forest planning and practices related to water management that auditees conducted between April 1, 2003, and October 21, 2005. Auditors reviewed documents and examined field practices to assess compliance with water-related Code obligations, such as:

- ground-based equipment kept more than five metres from streams;
- no roads or cut or damaged trees within 100 metres upslope from water intake;
- water supply intakes and structures protected;
- road maintenance practices minimized sedimentation into streams; and
- affected water licence holders notified 48 hours or more before road construction or deactivation.

### Sediment Estimates / Field Assessment of Practices (effectiveness)

The audit used a methodology developed by the Ministry of Forests and Range (MOFR) FRPA Resource Evaluation Program[4] to estimate the quantity of sediment generated and delivered to streams from a selected site associated with forestry development (refer to Appendix B). To undertake this work, the audit team included two registered professionals expert at assessing erosion potential.

The sediment estimate methodology focused on road systems and other forestry related disturbances in proximity to natural drainages. In practice, this involved detailed inspection of

stream and natural drainage crossings near roads or trails, as well as all roads running parallel to streams, and a range of other road construction and harvesting practices that could lead to sediment generation and transport to streams. Auditors estimated the amount and nature of sediment that any site would likely deliver in the upcoming year by inspecting disturbed surface areas draining towards any natural drainage. In addition, auditors assessed management practices employed at each site to determine if appropriate measures had been taken to minimize sediment delivery to streams.

### Water Sampling

The audit team conducted the fieldwork during the week of October 17, 2005. It rained heavily before and during the fieldwork. The weather during the week was typical of a heavy fall rain event, but the runoff was not as sustained as typical conditions during the spring freshet. The rainstorm occurred over a three-day period and measured 32 millimetres on average between the two watersheds. This level of rainfall occurs four to five times per year in the area, based on historical information.

The wet weather gave the audit team an opportunity to collect water samples to assess whether forest practices were generating sediment at this time. A total of 28 samples were taken over two days; 20 in the Norms Creek watershed and 8 in the Springer Creek watershed. Most samples were collected below the areas that had active forest operations but, where practical, samples were taken above active operations to provide comparative information about background turbidity levels. A laboratory assessed each sample for turbidity[10] as measured in nephelometric turbidity units (NTU). The results of the sampling were expected to be indicative of the typical water quality impacts during non-freshet rainfall events from the forest practices subject to audit.

# Detailed Findings

## Compliance Findings

Compliance at the time of the fieldwork consisted of compliance with Forest Practices Code provisions, which were continued under FRPA as of January 2004. All activities subject to audit were conducted under Code forest development plans[vii] (FDPs) and amendments. Transition provisions of FRPA require that these operations comply with the Code.[iv] There were no forest stewardship plans[v] in effect within the audit area during the audit period.

The audit found that auditees' forest planning and practices complied in all significant respects with the Code's requirements for water management.

The audit identified one area where improvement was needed. The Code requires licensees to give at least 48 hours notice of road construction or deactivation work to water licensees or their representatives. Similarly, FRPA requires affected water licensees or affected water purveyors to be notified at least 48 hours before commencing such activities.

MOFR district staff has stated that this notification requirement, which is exclusive to community watersheds, is not intended to apply to individual water licence holders in the watershed. However, the Code requires that both water suppliers and affected water licensees not represented by the water supplier are to be notified in advance of these activities in community watersheds.

Springer Creek notified affected water licensees, but the Norns Creek forest licensees did not fully meet the notification requirement. For instance, Atco notified RRID of planned road construction but did not notify other affected water licensees in Norns Creek. Kalesnikoff notified water licensees in the immediate vicinity of its operations but did not notify RRID. While both Atco and Kalesnikoff effectively communicated with those they considered most likely to be affected by any adverse impacts of their forest activities, their notifications did not fully meet the requirements imposed by the legislation. However, since the audit found no adverse impacts from forest operations, either observed in the field audit or reported by interviewed water users, the auditors found that these instances of non-compliance regarding notifications were not significant.

## Effectiveness Findings

### Criterion 1 – Background Information

Adequate background information has been collected to plan watershed activities.

**1.1 Licensees are aware of the legislation, relating to protecting water quality, governing their operations in community watersheds.**

All licensees are sufficiently aware of legislation relating to protection of water quality. They vary in their level of understanding of DWPA, but there have been no DWPA obligations imposed on them to date so the level of knowledge that they have is adequate.

**1.2 Licensees are aware of the location of the water systems in the community watersheds, and the capabilities of those water systems.**

In part, this sub-criterion was developed in consideration of the FRPA objective for drinking water to prevent the cumulative effects of forest activities from resulting in "the water from the waterworks having a material adverse impact on human health that cannot be addressed by water treatment." The meaning of this objective is not entirely clear. Presumably, to meet this objective, a degree of adverse impact from forest activities is acceptable, so long as the impact does not overpower the downstream treatment capabilities. The requirements for water treatment are governed by DWPA.

Licensees are sufficiently familiar with the location of water systems in the watersheds. Most forest operations in the audit were far from water supply intakes. Only Kalesnikoff's forest practices were close to intakes, and Kalesnikoff verified the precise field location of all nearby intakes.

Licensees are also sufficiently familiar with the capabilities of the water supply systems in the vicinity of their operations. However, rather than managing to the limits of treatment systems, licensees demonstrated that they conduct forest practices that minimize impacts to water quality and operate with that as their primary objective (refer to sub-criterion 4.1 for a more detailed discussion).

**1.3 Water quality, including turbidity and water quantity, has been measured to determine the normal range of variability for the watershed. Licensees have obtained this information and incorporated it into their planning framework.**

This sub-criterion assumes that it is important to understand the inherent water quality in the watershed without the influence of forest activities. While not specifically a responsibility of licensees to measure this, they should know whether it has been done and utilize the information in their planning.

Both watersheds have a long history of resource activity. Consequently, there is no baseline information available. It is difficult to know normal levels in watersheds with such a long history of development, suggesting that this criterion is based on ideal rather than actual conditions.

Nonetheless, one licensee, Atco, has done considerable work in partnership with RRID to collect water quality information between 1998 and 2003 at several sample points in the Norns watershed. The Ministry of Environment (MOE) has provided support for this work in the past and is using the information to prepare draft water quality objectives for the watershed. No similar water quality information has been collected for the Springer Creek watershed.

**1.4 Planning takes into account the proximity and potential impacts of activities other than forestry in the community watershed.**

Licensees are clearly aware of other uses, such as recreation and periodic mineral exploration, in each watershed. In the two audited watersheds, the audit detected no instances where forest operators needed to alter their plans or practices to account for non-forest activities.

## Criterion 2 – Responsibilities, Objectives and Communication

The responsibilities of the various participants in the matter of water quality and quantity in the community watershed have been delineated and are understood; the objectives and expectations for water quality have been established; and there is a reasonable level of communication among water suppliers, licensees and government agencies.

**2.1 The responsibilities of the various participants in the matter of water quality and quantity in the community watershed have been delineated and are understood.**

The responsibilities of forest licensees are clear and they have a good understanding of what is expected of them. The roles of government agencies and water suppliers have undergone significant change as a result of recent legislation and policy.

MOFR has historically had a significant role in planning in community watersheds, in part through ongoing involvement in watershed technical committees, which were established for both of these watersheds. With the recent change in the ministry's role associated with FRPA, MOFR's involvement in the management of water quality has changed. While the ministry retains its compliance monitoring and enforcement role, its involvement in planning forest development has been significantly reduced. The technical committees still exist, but are less active. There are no specific expectations for the committees, and MOFR is involved only on an as needed basis.

In this framework, MOFR is challenged to maintain an effective stewardship role in a working environment where licensees and water suppliers are the main players and agencies are not actively involved.

MOE's residual involvement in forestry planning in community watersheds ended when it ceased being involved in the review of FDPs. It has not conducted a program of inspections for some years, but will respond to issues that arise. The recently established Water Stewardship Division consolidates the core business of water stewardship for the ministry. MOE has a policy responsibility with respect to water, including primary responsibility for administering the *Water Act*, as well as providing technical support to the Interior Health Authority, government agencies and water purveyors regarding source water protection. MOE is also leading the development of water quality objectives.

The Interior Health Authority, and specifically the drinking water officers, are now required by DWPA to be involved in the regulation of activity relating to source water above the water intake, despite having little expertise and experience in land-based activities. Specifically, DWPA prohibits a person from causing a drinking water health hazard. Drinking water officers have powers to abate or prevent a drinking water health hazard from occurring. While drinking water officers do not directly regulate forest activities, they may need to make orders to protect water where upland activities are creating a drinking water health hazard. Understandably, the health authorities are still developing the framework for how they will deal with these new responsibilities and relate to the land-based ministries, whose purview this has historically been. Government ministries have been working for several months to develop a memorandum of understanding that will clarify responsibilities for managing source water protection.

The importance of a workable framework can also be seen in the requirements for water suppliers. They are required to meet water quality objectives (this will typically mean the Canadian drinking water guidelines, as modified by any locally established water quality objectives), but they have no authority over activities in the watershed or control over access to it.

Overall, there is less leadership and direction given by agencies than in the past, and more is left to water suppliers and licensees to work out between themselves. Responsibilities are fairly clear, but have created some major challenges, and government still has work remaining to effectively implement its water management framework.

Although government's water management framework is not fully deployed, the audit found no evidence of consequential water quality impacts.

## 2.2 Objectives and expectations for water quality have been established.

Government objectives for water quality under FRPA include requirements for riparian areas and for community watersheds. For riparian areas in general, government's objective is to conserve water quality at the landscape level. In community watersheds, government's objective for drinking water is to prevent the effects of forest activities from adversely impacting the quantity and quality of the water (no material adverse impact on human health). These broad government objectives for water management were not formally in place during the audit because no forest stewardship plans were in effect to trigger them.

It is also possible to define water quality objectives more specifically. For example, a water quality objective for turbidity, during normal clear flow outside the spring runoff period, might be a one NTU increase or less, where the background turbidity is five NTU or less. Specific water quality objectives more clearly define expectations for water quality, although it may be difficult to monitor to determine if specific objectives are achieved, given that it is difficult to relate numerical objectives directly to forest practices.[11]

Government has not established specific water quality objectives for the two audited watersheds. MOE has been working on draft objectives for the Norris watershed for the last several years. No work has been done for the Springer Creek watershed because it is not currently used as a source of drinking water for Slocan so is considered a low priority.

Although there are no formal water quality objectives in place, expectations for water quality are generally clear among all participants, including licensees—to minimize impacts of forest activities on source water quality. The audit found no evidence of water quality impacts or inadequate water management as a result of the absence of specific water quality objectives.

## 2.3 Communication among forest agreement holders, government agencies and water suppliers are responsive and effective.

Each watershed is unique in terms of participants' communication needs and expectations. Further, the needs and expectations of water suppliers change over time in response to factors such as the level of activity proposed, the amount of historic forest activity and the interest level of the people representing water suppliers and water users. Communication between agreement holders and water suppliers is usually about licensee development plans, results of forest activities, and the ongoing information needs of the water suppliers. These communications are often conducted via the watershed technical committees.

The audit found that communication between agreement holders and water suppliers has met most, but not all, expectations of the participants. For example, some water suppliers are not familiar with the results of forest activities. The water suppliers are exposed to plans but are not aware of the results after operations are completed. Also, water suppliers do not always provide licensees with complete information about their supply systems. Overall, however,

communication between agreement holders and water users and suppliers has been generally satisfactory to participants and is therefore considered adequate. Communications related to notification are discussed separately under Compliance Findings and under sub-criterion 5.3.

There is discussion among resource agencies, water suppliers and licensees on aspects of source water protection. Also, agencies maintain ongoing availability for consultation on these matters. The audit found, however, that government agencies do not become directly involved in source water protection at the watershed level unless responding to problems. For the most part, licensees and water suppliers are left to negotiate solutions to any concerns.

### Criterion 3 – Planning to Address Potential Water Quality and Quantity Impacts

Plans and strategies address potential water quality and quantity impacts.

**3.1 Areas of erosion risk and areas producing sediment have been identified and mapped (e.g., soils with high erosion hazard ratings and areas with unstable slopes, and ditch lines at stream crossings).**

Several watershed assessments, terrain inventories and rehabilitation plans for Norms Creek have been completed since 1988. Springer Creek has also been the subject of several watershed assessments and terrain inventories since 1997. The audit found that licensees either prepared or obtained sufficient information regarding erosion risk, and appropriately incorporated this information into their forest development planning.

**3.2 Licensees have identified higher risk forest practices that can impact water quality and quantity and have incorporated this awareness into environmental policy and procedure, and the forest operational planning process.**

Each of the licensees has a functioning environmental management system as part of a forest certification framework that addresses higher risk forest practices. Within these systems, each licensee has identified higher risk forest practices that can adversely impact water quality, such as conducting in-stream works, and have developed appropriate plans and work procedures to safeguard water quality.

**3.3 Licensees have developed results and strategies in relation to the objective established for water quality in the community watershed.**

As previously stated, there are no formal water quality objectives for the watersheds. Also, results and strategies are not required under the Code. Nonetheless, licensees have identified adequate measures to protect water in their FDPs.

In addition, Kalesnikoff has an approved FSP under FRPA for its area of responsibility in the Norms watershed. This plan, approved in April 2005, contains results and strategies for

management of water quality. However, the FSP is not subject to audit, since Kalesnikoff conducted the audited forest practices under pre-existing FDPs.

**3.4 Plans, including detailed operational plans (site plans, road layout etc.), address sediment and other water quality risks by avoiding high-risk areas, or designing risk mitigation strategies where necessary.**

The audit found that licensee FDPs and site level plans appropriately identify and address risks to water quality.

**3.5 Plans adequately assess and manage for potential impacts on water quantity and timing of flow.**

Watershed assessments for both watersheds include calculations of equivalent clearcut area (ECA) for each sub-drainage. These numbers provide insight into estimating the effect of harvesting on changes in peak flow. As part of their preparation of FDPs under the Code, licensees update ECA calculations for any proposed harvesting in the watersheds. MOFR staff review these calculations and can refer them to forest hydrologists if any concerns are identified.

Overall, the audit found that plans adequately assess and manage for potential impacts on water quantity and timing of flow.

## Criterion 4 – Practices

Practices on forest land within watersheds are effective in minimizing impacts to water quality, quantity and timing of flow.

**4.1 Licensees conduct forest activities to minimize impacts to water quality, quantity and timing of flow.**

Audit findings regarding the effectiveness of licensees' forest practices are grouped as follows:

- Results of watershed assessments
- Observations of forest practices
- Results of sediment estimates
- Results of water quality sampling

## Results of Watershed Assessments

*Norns Creek*

The watershed assessment identified several sediment sources in Norns Creek, the most significant of which was a recently constructed road on private land in the lower portion of the watershed. Other sediment sources included several older partially-revegetated landslides along the main channel. Past road deactivation projects have addressed most of the sediment sources identified in previous watershed assessments, including those associated with older forest roads.

In terms of sediment output, water quality in Norns Creek is affected by private land road construction, historical landslides related to harvesting in the 1970s and 1980s, and by active forestry roads. The auditors consider the overall sediment hazard to be relatively low.

The watershed assessment also assessed the equivalent clearcut area in each watershed. In the Norns Creek watershed, the tributaries ranged from a low of 6 percent in Norns Creek to 12 percent in upper Ladybird Creek, with the overall watershed at approximately 10 percent. In this watershed, it is unlikely that the harvest rate has had an impact on water quantity and timing of flow.

*Springer Creek*

The main sources of sediment in the watershed are landslides in sandy soils associated with a deactivated mainline road adjacent to a stream in the lower watershed. The landslides are ongoing in the confined reaches of the mid and lower watershed. Some of this activity is related to the presence of an old deactivated mainline, as well as abandoned mining exploration roads. There is also sediment generated from road cuts in sandy soils along forest roads, in particular in the Speculator Creek sub-drainage.

In terms of sediment output, water quality in Springer Creek is affected by periodic landslides associated with old forestry and mining roads and by active forestry roads. The overall sediment hazard is considered moderate. However, the auditors consider that the turbidity hazard is low because of the coarse sandy texture of the soils, since turbidity is primarily caused by smaller clay and silt particles and not by sand.

ECA in Springer Creek tributaries ranged from a low of 16 percent in Speculator Creek to 50 percent in Algiers Creek, with the overall watershed at approximately 20 percent. None of the harvesting subject to audit was in Algiers Creek. In this watershed, it is possible that the harvest rate has had an impact on water quantity and timing of flow, but the channel assessment conducted as part of a previous watershed assessment found no evidence of this.

## Observations of Forest Practices

The focus of the field work was on those forest practices that could have impacts on water quality and quantity. Samples consisted of road crossings of streams, areas where ditch water could reach streams, roads adjacent to streams and harvesting near streams.

At each sample site, auditors examined the effectiveness of water management practices. Overall, the audit found licensee practices to be effective in minimizing erosion. In most locations, licensees adequately protected roads from structural failures using armouring and well-placed drainage features, and they promptly deactivated temporary roads (see Figure 1). In most locations, licensees also revegetated exposed soils and successfully directed ditch water onto the forest floor and away from stream channels.

Figure 3. This bridge in Noms Creek is well aligned so that water drains away from the creek at both ends of the bridge. The bridge deck is also lined with geotextile material to help prevent dirt from getting into the creek.

Figure 4. Well-stabilized road fill and culvert in Springer Creek.

Figure 5. Large cutbank in Springer Creek. Large boulders have been placed near the culvert inlet as a stabilizing measure. Note the evidence of minor erosion on the cutbank and the road surface near the culvert outlet.

Figure 6. Straw bale placed in ditchline in Springer Creek. It is partially effective in blocking sediment, but requires regular maintenance to maintain its function.

Although the audit found that practices were generally very good, two areas for improvement were identified:

1. Licensees had not always promptly revegetated recently disturbed areas. This shortcoming was identified on a few deactivated roads and at one recently installed bridge site.

2. In a few instances, a licensee did not direct ditch water towards forest floor areas and away from stream channels, resulting in some sediment entering the water system.

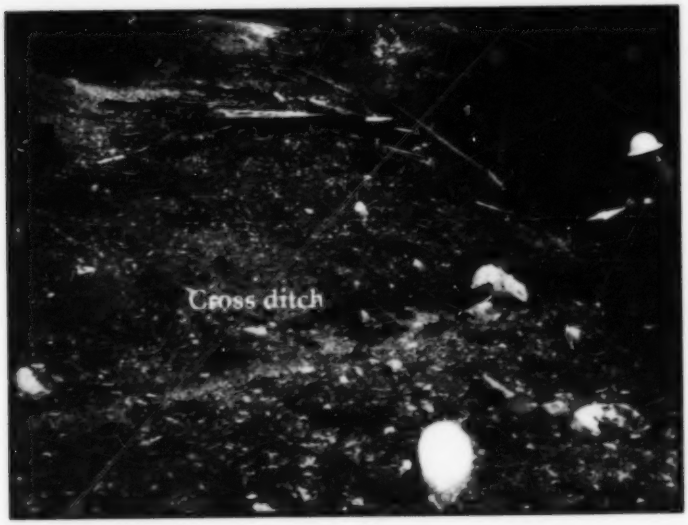



Figure 7. Deactivated road in Norns Creek. The road has been cross-ditched and is well vegetated at stream crossings.

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Figure 7. Deactivated road in Norns Creek. The road has been cross-ditched and is well vegetated at stream crossings.

Figure 8. Deactivated road in Norns Creek. The natural drainage has been restored but the site has not been revegetated.

Figure 9. Half water bar installed above culvert in Springer Creek. The waterbar is not well placed since it directs water from the road near the culvert outlet, with direct connectivity to the creek. Where possible, road surface and ditch water that may transport sediment should be directed onto the forest floor. This site is also poorly vegetated.

## Results of Sediment Estimates

It is essentially impossible to prevent at least some sediment created during forest activities from entering stream systems. Road construction, maintenance and deactivation practices all expose soil, as do some harvesting practices such as building and using excavated or bladed skid trails. Exposed soil is subject to erosion. The risk of erosion is highest where exposed soil particles are small (clay and silt) and rain can transport the sediment downslope into ditches and streams.

The other main sediment source is landslides, either natural or associated with forest practices. The audit examined the watersheds for evidence of landslides in the aerial watershed assessments and during the audit work on the ground. Numerous older (pre-Code) landslides have occurred in mid or lower slopes in both watersheds and continue to introduce sediment into the stream systems. However, no landslides were found that were associated with forest practices subject to audit. Landslides tend to be the largest potential sediment sources for streams compared with rain-related erosion.

The sediment estimate methodology used in the audit approximates the amount of sediment expected to enter the stream system in a given area over one year. Because of the wet conditions during fieldwork, the auditors were able to see direct evidence of erosion on road running surfaces. The audit did not examine forest practices in locations where there was no direct connectivity to streams and therefore no risk of sediment reaching the stream system.

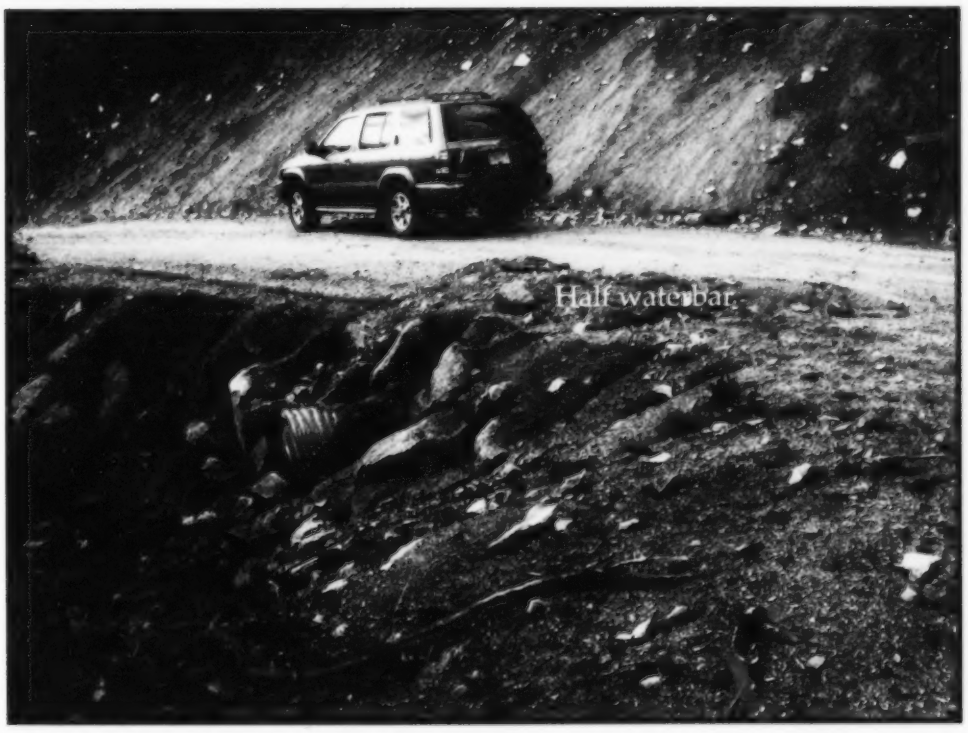
Table 2 shows the results obtained from the sediment estimates. The results are grouped into categories reflecting the volume of sediment in cubic metres expected to be delivered into the stream system over a year.

**Table 2. Results of sediment estimates over a one year period**

| Licensee | Low Sites (<1 $m^3$) | Moderate Sites (1-5 $m^3$) | High Sites (5.1-20 $m^3$) | Very High Sites (>20.1 $m^3$) |
|---|---|---|---|---|
| Atco | 21 | 5 | 0 | 0 |
| Kalesnikoff | 7 | 1 | 0 | 0 |
| MOFR* | 0 | 0 | 1 | 0 |
| Pope&Talbot | 8 | 5 | 0 | 0 |
| Springer Creek | 30 | 14 | 1 | 0 |
| Totals | 66 (71%) | 25 (27%) | 2 (2%) | 0 |

** Because the work had been done within the audit period, auditors also assessed a bridge located on Norns Creek which had recently been installed by the Ministry of Forests and Range.*

Figure 8. Deactivated road in Norns Creek. The natural drainage has been restored but the site has not been revegetated.

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** Because the work had been done within the audit period, auditors also assessed a bridge located on Norns Creek which had recently been installed by the Ministry of Forests and Range.*

The sediment estimates show generally positive results. About 71 percent of sites sampled had low levels of sediment input. Of the remaining 29 percent, about 2 percent were rated as high sediment input sites. The two high sediment sites were bridge sites that had high road cuts exposing large amounts of fine textured soils. The estimated sediment production from each of these sites was less than ten cubic metres. None of the sites in the audit was rated very high.

There is no direct way to correlate the sediment estimates, as measured in the audit, with quantitative measurements of turbidity. This is because many different factors are involved, such as duration and intensity of rainfall events, different flow levels of streams, etc.

To provide an indication of how this relates to water quality, a simplistic example is to assume all sediment goes evenly into the system over the year. The total estimated sediment input into Norns Creek from sampled areas is 47 cubic metres over a year (a figure derived by adding up all of the sediment estimates from the audit samples). Since the auditors examined nearly all areas of recent forest activity, this accounts for virtually all of the potential sediment associated with current forestry operations. The average flow of Norns Creek, except during freshet, is about one cubic metre per second. The sediment under these assumptions would average about 1.3 NTU over background levels with a higher number expected during spring runoff and lower during low flow periods. In other words, in this example, the forest activities are adding about 1.3 NTU above the levels that would be experienced in the absence of forest activities.

**Results of Water Quality Sampling**

The water quality parameter most influenced by forest activities is turbidity, which is a measure of the relative clarity of water. More specifically, it is a measure, in NTU, of the scattering effect of light on particles suspended in water. In a forestry context, these particles are typically made up of clay and silt components of soil and organic matter such as leaf fragments.

By itself, turbidity is not a significant health risk. However, in addition to causing drinking water to taste and look unappetizing, turbidity interferes with water treatment by protecting biological organisms such as algae, bacteria and viruses that adhere to the surface of the particles. This reduces the success of water treatments such as ultraviolet light and chlorination in killing the pathogens. Also, turbid water is more expensive to treat and causes problems in water supply systems by clogging filters (refer to Appendix A for a discussion of the major factors that affect water quality).

The Canadian drinking water (CDW) guidelines call for a turbidity of less than one NTU for treated drinking water and less than five NTU for aesthetic objectives. Drinking water with turbidity greater than five NTU has noticeable color or taste. The Ministry of Environment also has a turbidity guideline for untreated drinking water:

> For raw waters of exceptional clarity (less than or equal to five NTU) which normally do not require treatment to reduce natural turbidity, induced turbidity should not exceed one NTU and the total turbidity should not exceed five NTU at any time.[xii]

Table 3 shows the results of the water quality sampling for turbidity. Water quality sampling was done during a significant rainfall event and upstream of primary water supply intakes and private land.

**Table 3. Results of Water Quality Sampling**

| Licensee | # of samples above development | average NTU value | % meeting CDW guideline* (< 1 NTU) | # of samples below development | average NTU value | % meeting CDW guideline* (< 1 NTU) |
|---|---|---|---|---|---|---|
| Atco / Pope & Talbot | 2 | 0.48 | 100 | 8 | 0.73 | 75 |
| Kalesnikoff | 2 | 0.68 | 100 | 8 | 0.58 | 100 |
| **Springer Cr | 0 | - | - | 8 | 0.99 | 62.5 |

** The CDW guideline applies to treated water, whereas these samples are of untreated water.*

The audit results show that all four samples of untreated water above forest development had turbidity of less than one NTU, and thus already meet the CDW guideline for treated water. In addition, 19 of 24 samples of untreated water below development also had turbidity of less than one NTU. The five samples greater than one NTU (two in Norns Creek and three in Springer Creek) were all less than four NTU, and therefore meet the Canadian drinking water five NTU aesthetic guideline as well. Average NTU values for both watersheds are less than one NTU, suggesting that the MOE guideline for induced turbidity in untreated drinking water is also met in this set of samples.

The results show high water quality (low turbidity) during a very rainy period, both above forest development and below. The results, however, are not necessarily indicative of results expected during the spring freshet, which typically has a period of high turbidity at the peak of snowmelt. The audit sample results for Norns Creek are generally consistent with water sampling results collected in that system between 1998 and 2003 (refer to Appendix A for graphs showing 2001-2003 annual turbidity results).

In summary, the audit found that the water quality of sampled water during a significant fall rain event was high, both above areas of forest development and below. These results indicate that forest practices were having very little effect on the water quality at the time of testing.

**4.2 Licensees conduct range activities to minimize sediment production that could impact water quality and to minimize fecal contamination of water bodies that could transport harmful material downstream and impact water quality.**

This sub-criterion is not applicable since there are no range practices within the audit watersheds.

## Criterion 5 – Monitoring and Reporting

Licensees, water providers and government agencies monitor to ascertain that water quality and quantity are maintained.

**5.1 Forest and range practices are monitored to assess achievement of plans in relation to conservation of water quality and quantity.**

Licensees perform a satisfactory level of monitoring of their own operations. Atco, Kalesnikoff and Springer Creek all have environmental management systems developed in accordance with certification systems. Licensees conduct self-monitoring to meet the requirements of these systems. Pope & Talbot was not assessed for this sub-criterion.

**5.2 Water quality and flow is monitored and the data are sufficient and available to assess changes in water quality and quantity in the community watershed.**

Licensees are not legally required to monitor water quality. Under DWPA, water suppliers are required to monitor drinking water sources in accordance with the regulations at least four times per month for small systems.

In the Norns Creek watershed, Atco and RRID jointly monitor water quality and quantity at two locations above the RRID intake. In addition, they have monitored Norns water quality at additional sites for several years, providing a strong baseline data set. MOE is using this data as a primary source of information to develop water quality objectives for the watershed. RRID also monitors the quality of treated water.

No water quality or quantity monitoring is done at present in the Springer Creek watershed, since the village of Slocan does not use it as a source of drinking water.

Neither RRID nor the Village of Slocan have identified water quantity as an issue. Some individual water licence holders in the Norns watershed have expressed concerns about the potential adverse impact of forest activities on the supply of water to their systems. In these cases, the systems are on smaller tributary streams rather than the main channel. During interviews, auditors did not receive any reports from water users of quantity impacts resulting from forest activities.

The audit found the level of monitoring of water quality and quantity is reasonable in both watersheds, taking into consideration the level of risk to drinking water.

**5.3 Licensees appropriately notify water suppliers as soon as possible when a turbidity event becomes apparent or likely. Licensees provide 48-hour notice of planned road construction and deactivation work to affected water licensees and water suppliers.**

The audit did not detect any turbidity events that had occurred during the audit period, so the sub-criterion was not tested. However, the licensees' environmental management systems contain procedures that address communications if an erosion event occurs.

As detailed in the Compliance Findings section, the audit found that Springer Creek appropriately notified affected water users. However, in Norns Creek the audit found that while licensees met the notification requirement to a degree, not all affected water licensees were notified every time. In addition, documentation of 48-hour advance notification was not always complete.

**5.4 Government agencies with enforcement responsibilities effectively monitor licensee activity and obligations in the community watershed.**

The audit found that the Ministry of Forests and Range conducted 43 inspections (26 in Norns Creek and 17 in Springer Creek) during the audit period. This is a reasonable number of compliance and enforcement inspections in the two watersheds over the two and a half year audit period. None of the inspections identified forest practice issues that could affect water quality.

During this period MOE and the Interior Health Authority did not monitor licensee activities.

## Criterion 6 – Observable and Recorded Results

**6.1 Forest practices have not materially affected water quality at the intake.**

Water quality data collected by Atco and RRID over the past several years shows that water quality in the Norns watershed is high. The audit water samples also indicate a high water quality, during a relatively high rainfall event.

Forest practices observed in the Norns watershed also indicate that licensees have been diligent in minimizing sediment input into streams. During interviews with water users and regulatory agencies, auditors received no complaints about turbidity in relation to forest practices. In Norns watershed, RRID has stated that it has no water quality concerns related to forest practices on Crown land, but it does have concerns about the impact of private land activities.

Although there is no ongoing water quality monitoring in the Springer Creek watershed, the audit water quality sampling showed good water quality during high rainfall. Forest practices

observed in the Springer Creek watershed also indicate that licensees have been diligent in minimizing sediment input into streams.

The audit is not able to definitively conclude on this sub-criterion. However, the forest practice and water sample evidence collected in the audit supports the statement that forest practices have not materially affected water quality in the two watersheds.

**6.2 Forest practices have not materially affected the quantity of water or timing of flow at the intake.**

Because insufficient water quantity data is collected for the two watersheds, the audit was unable to adequately assess practices in relation to this sub-criterion. However, water users have not experienced problems related to water quantity. Also, the audit watershed assessments did not reveal any evidence to suggest that the rate of cut was high enough to affect water quantity or timing of flow.

In addition, forest development planning takes into account the potential for affecting water quantity and timing of flow by assessing the ECA calculations as part of harvesting proposals. These assessments are reviewed by MOFR.

**6.3 Range practices have not materially impacted water quality at the intake—sediment or fecal contamination, or quantity or timing of flow.**

This sub-criterion is not applicable since there are no range practices within the audit watersheds.

# Appendix A: Background on Turbidity and Water Quality

## Part 1 – Major Factors that Affect Drinking Water Quality

This is a partial list of major factors that can affect drinking water quality. Refer to the Canadian drinking water guidelines for details on these and additional factors. The Canadian drinking water guidelines are located at the following website:
http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index_e.html

***Microbiological Factors*** – this includes viruses, bacteria such as *E. coli* and *Campylobacter*, and protozoa such as *Giardia* and *Cryptosporidium*. These organisms represent significant health risks where present in concentration in drinking water. The primary goal of water treatment is to remove or kill these organisms. These organisms can adhere to sediment and organic material, reducing their sensitivity to disinfection and reducing the effectiveness of water treatment.

***Metals*** – including copper, iron, lead, manganese, selenium, molybdenum and many others. Most metals exist in untreated and treated water at very low concentrations. Although undesirable in drinking water, at low concentrations most metals do not represent significant health risks, with lead being an exception. Since trace metals exist naturally in soil, increased sedimentation from forest practices can increase metal content in stream water, although many metals adhere to soil particles, and do not go into solution.

***Chemicals*** – this includes a wide variety of compounds such as pesticides, fuel, fertilizers, benzenes, sulphates, nitrates, etc. The Canadian drinking water guidelines include maximum acceptable concentrations for more than 60 chemical compounds. The risk of introducing chemicals into stream systems through forest practices is relatively low. However, examples of potential risks include fuel spills from poor machinery refuelling practices or accidents, and fertilization and herbicide treatments of forest crops.

***Turbidity*** – is a measure of light transmission through water. Turbidity is affected by sediment such as clay and silt particles as well as dissolved and fine particulate organic materials. While turbid water in itself does not represent a health risk, it reduces the efficacy of some water treatments and is an indirect measure of sediment which can also reduce water treatment effectiveness. Turbidity is the most common factor influenced by forest practices, through the introduction of sediment and organic matter into streams.

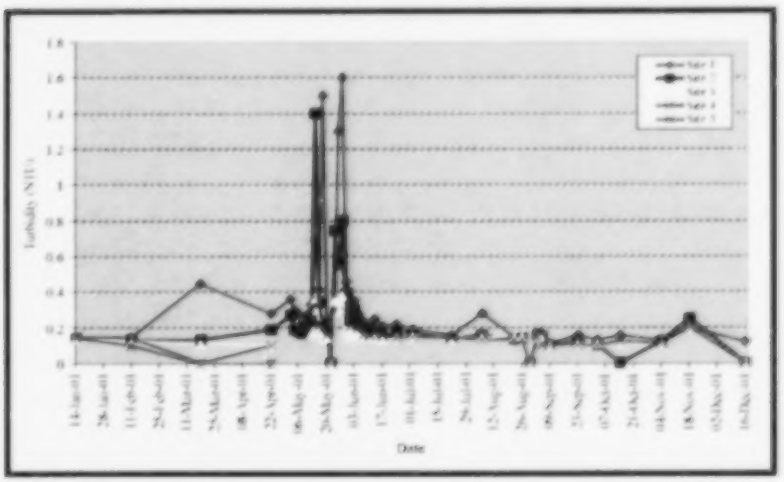
***Aesthetic Factors*** – such as colour, taste, smell, temperature. These aesthetic factors are generally not a health risk. The Canadian water quality guidelines set aesthetic objectives for these parameters. In a forestry context, poor riparian management practices on small streams can contribute to increased stream temperatures when shade vegetation is removed from streambanks. Organic materials introduced into the water can also contribute to poor water colour, taste and smell.

## Part 2 – 2001-2003 Turbidity Results for Norns Creek

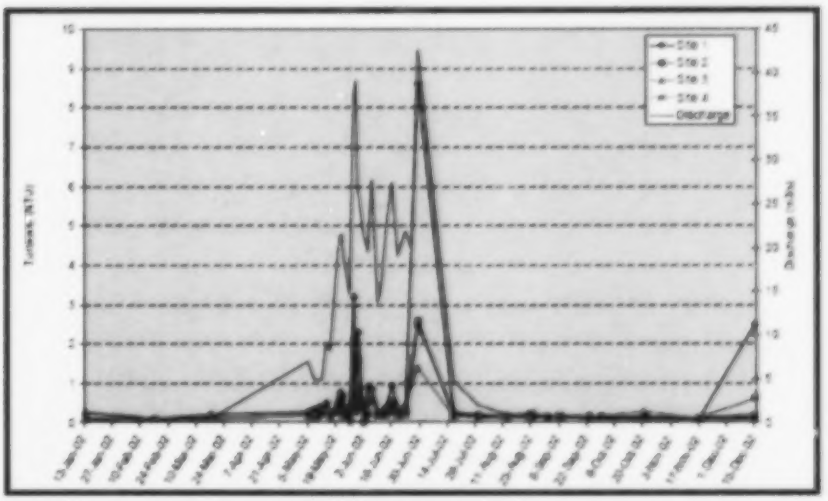
The graphs below are from water resources inventory reports regarding Norns Creek, prepared for Atco and funded under the Forest Investment Account. These reports can be found using the following internet link and "ladybird" as the search criterion:

http://srmapps.gov.bc.ca/apps/acat/jsp/index_public.jsp

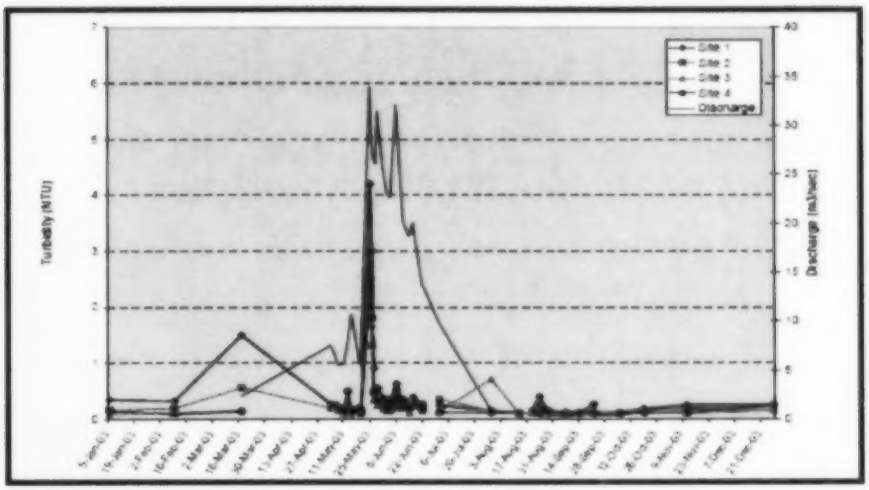
Note that the scale for turbidity varies in each of these graphs.



2001 - Comparison of turbidity at five sites along Norns Creek.



2002 - Comparison of turbidity at four sites along Norns Creek.




2003 - Comparison of turbidity at four sites along Noms Creek.

# Appendix B: Audit Sediment Estimate Methodology

The best way to determine whether forest roads and cutblocks located near natural drainages are causing degradation to water quality is to visit the sites when it is raining heavily or when spring snow melt is at its peak. Such a precisely timed field visits will normally provide strong evidence about whether water quality is being degraded, as cause and effect becomes obvious. However, timing such visits is a logistical challenge and still might not be the right time to capture the most important sedimentation events of the year. The Board required a methodology that would be more flexible for timing site visits and would provide consistent, reliable results that would directly link forestry related activities such as road construction and harvesting with water quality degradation. The audit used the following methodology, developed originally for FRPA's Water Quality Effectiveness Evaluation. This method is developed directly from the Universal Soil Loss Equation, which has been demonstrated to be quite accurate in thousands of applications around the world.

### 1. Site pre-selection

Using available forest development maps, the audit team selects sites associated with a licensee's operation that are most likely to influence water quality. This includes all potential sites where a licensee's forestry activities either created soil disturbance or altered drainage, thus potentially affecting downstream water quality. Selected sites include all stream crossings, culverts on roads running parallel to streams, harvesting or skid trail systems adjacent to streams, wind-thrown trees within riparian reserves, etc.

### 2. Carry out initial site inspections

A multidisciplinary team (forester, soil scientist, hydrologist) assesses all pre-selected sites, looking for signs of potential surface erosion or obvious past erosion and determines the probability of sediment reaching the stream. Once within the watershed, the team also assesses any other potential problem areas that have not been pre-selected.

### 3. Assess whether site disturbance could affect stream water quality

At each selected site, the team determines whether the drainage from the site is connected in any way to the natural drainage. This connection may be obvious or it may only occur for the heaviest rainstorm events or during spring snow melt. If there is no possibility that sediment generated at a site could reach the natural drainage, no further analysis of that site is required, regardless of the level of disturbance. If connectivity exists, an estimate of connectivity between zero and one is made. This estimate is roughly equivalent to the portion of water generated at the site that would reach a natural drainage.

## 4. Quantify sediment generation and delivery from site

Using Table 1 (at the end of this appendix), the team assesses:

*a. Potential surface erosion that would occur. They:*

i. Subdivide the site into individual components (cutbanks, ditches, road surface, overturned root balls etc.).

ii. Estimate the portion of fine sand, silt or clay that makes up the surface of each component.

iii. Estimate the surface area of each component (length x width of disturbed surface) for the most erosive portion (for example, portion of cutbank not vegetated).

iv. Estimate the depth of surface erosion that might be expected on such a surface (simple order of magnitude estimations, i.e. (none-0 mm, a little-1 mm, a lot-10 mm).

v. Calculate the potential volume of fine sediment from site to the stream.

*b. Observed mass wasting within the mini-catchment draining the site. They:*

i. Identify individual components of site that have experienced obvious past erosion (mass wasting is included in the analysis only if the volume is < ½ m3. Features such as rills, gullies, slumps and failure slopes are considered).

ii. Estimate the portion of fine sand, silt or clay that make up the surface profile of the component.

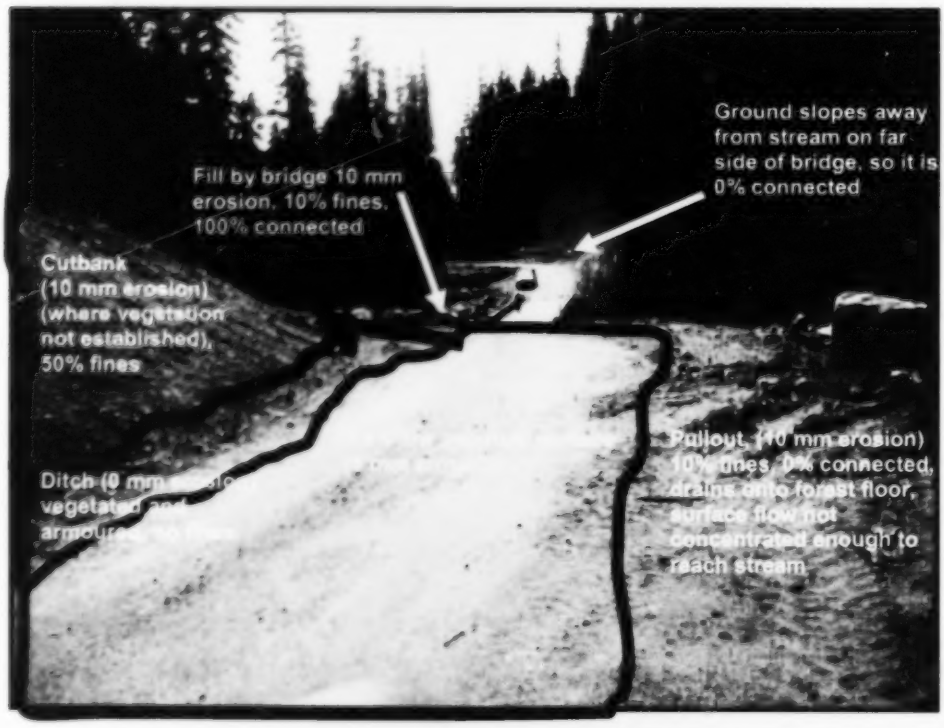
iii. Estimate the volume of material that has been eroded from a rill, gully or scarp face.

iv. Calculate the potential volume of fine sediment from site to the stream.

## Example of How a Site is Analyzed

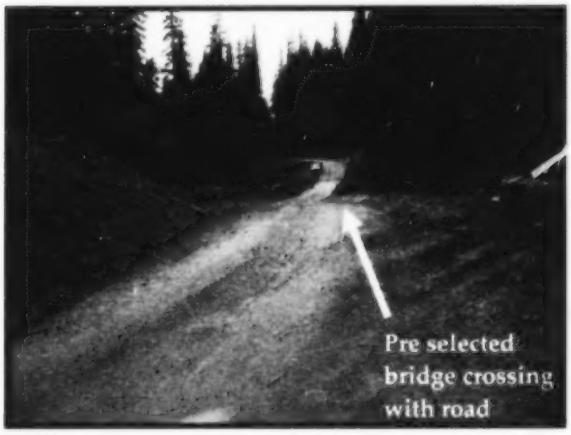
This lightly used forest road at a bridge crossing is selected for inspection as a result of preliminary map inspection. Upon reaching this site, it is apparent that the catchment is directly connected to the stream on the upslope near side (Connectivity=1) and not connected on the downslope far side (Connectivity=0).

## Delineation of Components and their Characteristics at Pre-selected Site


Ground slopes away from stream on far side of bridge, so it is 0% connected
Fill by bridge 10 mm erosion, 10% fines, 100% connected
Cutbank (10 mm erosion) (where vegetation not established), 50% fines
Pullout (10 mm erosion) 10% fines, 0% connected, drains onto forest floor, surface flow not concentrated enough to reach stream

## Example of How a Site is Analyzed

This lightly used forest road at a bridge crossing is selected for inspection as a result of preliminary map inspection. Upon reaching this site, it is apparent that the catchment is directly connected to the stream on the upslope near side (Connectivity=1) and not connected on the downslope far side (Connectivity=0).




## Delineation of Components and their Characteristics at Pre-selected Site

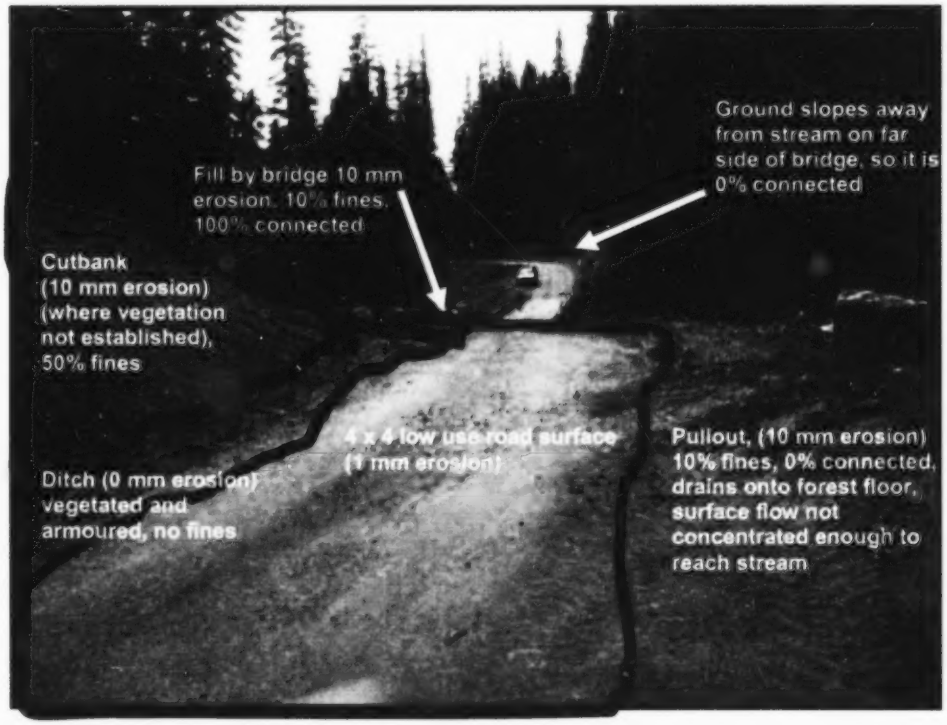


Table 1 shows a field card similar to the one used during the audit. For the example developed here, the site generated 0.51 $m^3$ of fine material from surface erosion. There was no sign of mass wasting at this particular site.

For natural or disturbed catchments, the annual generated volume of 0.51 $m^3$ of fine material is considered to have a low impact on downstream water quality. At this level of sedimentation, an expected turbidity increase of much less that one NTU would occur within a stream with a bank full flow one $m^3$ /sec[1].

## 5. Observations on Management of Site

Concurrent with the investigation of sediment delivery to the stream, the team assesses how the site is managed. In each case, the assessment examines whether the licensee has undertaken the level of management commensurate with the estimated risks to water quality from the given site.

From the example of this stream crossing, the observed management practices are all indicative of good water quality maintenance. These practices include use of good road surfacing material, ditches well armoured, surface decking of bridge raised to limit flow directly off bridge deck and the cutbank mostly re-vegetated.

[1] For this calculation, it was assumed that the sediment generated at site was delivered to stream during ten days over the course of the year.

Table 1. Example field card used for quantifying sediment generation and delivery from selected sites

| Select, Inspect and Characterize Sediment Generating Sites | | | | Determine Site Contribution to Stream Sedimentation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | a. Estimate Potential Surface Erosion Contribution | | | | b. Estimate Past Mass Wasting Contribution (if volume >1/2 $m^3$) | | |
| C1<br>Identify Sites that could possibly influence water quality<br><br>(Bridge crossings, culverts, skid trails, riparian windfall, slumping etc | C2<br>Estimate portion of artificial drainage reaching stream<br><br>none (0)<br>a little (0.1)<br>half (0.5)<br>a lo t (0.9)<br>all (1) | C3<br>Identify individual components of Sites within shared drainage.<br><br>(Cutbank, ditch, road surface, disturbed ground, sidecast, fill, slump face, etc | C4<br>Estimate portion of fine sand, silt and clay in eroded/ erodible material<br><br>none (0)<br>a little (0.1)<br>half (0.5)<br>a lo t (0.9)<br>all (1)<br><br>*For active road surfaces always choose 1.* | C5<br>Estimate surface area of identified components within mini catchment<br>L x W<br><br>*(Rough estimation by eye only)*<br><br>($m^2$) | C6<br>Estimate depth of erosion expected for surface of each component<br><br>None 0 mm<br>A little 1 mm<br>A lot 10 mm<br><br>(mm) | C7<br>Calculate total sediment contribution from surface erosion<br><br>C2 x C5 x C6<br><br>($m^3$) | C8<br>Calculation of fine sediment contribution from surface erosion<br><br>C4 X C7<br><br>($m^3$) | C9<br>Estimate volume of surficial material lost by mass wasting and gullying processes (if visually apparent)<br><br>L x W x D of failure(s)<br><br>*(Rough estimate by eye only)*<br><br>($m^3$) | C10<br>Calculate total sediment contribution from mass wasting component<br><br>C2 x C9<br><br>($m^3$) | C11<br>Calculate fine sediment contribution from mass wasting component<br><br>C4 x C10<br><br>($m^3$) |
| Bridge Xing | 1 | Left cutbank | .5 | 50 | 10 | .5 | 0.25 | | | |
| | | Left ditch | - | - | - | - | - | | | |
| | | Left road surface | 1 | 250 | 1 mm | .25 | 0.25 | | | |
| | | Bridge fill | .1 | 10 | 10 | 0.1 | 0.01 | | | |
| | | | | | | | | | | |
| | | | | Estimated potential fine textured sediment reaching stream from surface erosion on site ($m^3$) | | | 0.51 | Estimated past fine textured sediment reaching stream from mass wasting on site ($m^3$) | | nil |

# Appendix C: Summary of Comments Received on the Draft Report

Audit participants submitted the following comments during reviews of the draft report. Where necessary, references to specific sections have been adjusted to conform to the final version. Comments were submitted by two of the four forest licensees and the three government agencies. Robson Raspberry Improvement District and the Village of Slocan did not submit comments.

## Kalesnikoff Lumber Co. Ltd.

Three sections of the report note that licensees in the Ladybird watershed failed to notify all water suppliers and water users of imminent road construction in accordance with the legal requirements. Specifically, FPR Section 84 states, "At least 48 hours before commencement of road construction or deactivation in a community watershed, a person must notify affected water licensees or affected water purveyors".

The FPB interpretation of this regulation would indicate that every water license holder in a community watershed (community system or single use water license) would need to be notified of the pending works and that every notification (or lack thereof) would have to be sufficiently documented. In relation to the audited cutblocks and roads in Kalesnikoff Lumber's portion of Ladybird Creek, the company would have had to provide notification to 72 individual license holders outside of the organized community water purveyors of RRID and Spud Hill. This is no small feat for any company, as this requires mass letter mailouts 48 hours prior to every road and deactivation project or mass phone notification if a company has access to phone numbers for all water license holders. The current water license query on the Land and Water BC website only provides mailing addresses, not phone numbers. While the mailing addresses of the water queries tend to be fairly current, phone book listings for individuals are not, as many people do not list their phone numbers or move during the course of the year that phone books are in effect. When this interpretation is applied across the company's operations in the other community watersheds we operate within, the annual process of providing notifications compounds in size (some community watersheds such as Deer Creek do not even have phone infrastructure to provide notifications). This is further complicated by the fact that road activities, while generally planned, are often commissioned or decommissioned by factors outside of a company's control (i.e., weather factors, fire season restrictions, funding limitations, contractor downtime, etc.) or continue over multiple seasons or years with significant down-time between operations. Significant disruptions of any sort could require renotifications to occur.

Norns watershed encompasses numerous feeder streams into the main Norns Creek that have different names. The only way to get an accurate number of license holders is to query each named feeder creek to the mainstem of Norns. Thus, you would have to query Gibson Creek, Kinney Creek, Michael Creek, Dudley Creek, Birch Creek, etc. to find out the true number of

individual water license holders in the confines of the watershed. The MOE water query database will not provide a total listing of water license holders in the confines of a watershed using Norns Creek as the query variable. A number of years back, the MOE provided us with a GIS coverage showing licensed points of diversion in the Arrow and Kootenay Lake Districts. When you open up the attribute tables in GIS, each point is given a unique reference indicator that can be used to query the license information from the web. Each point has an associated stream name. I am providing you with a printout of the tables for every POD that occurs in the confines of the Norns Watershed. As stated previously, there are 87 known POD locations in the watershed which may be on the mainstem of "Norns" or located on another named tributary to Norns

Since the onset of the FPC, there has been a general understanding at the local level that a community watershed designation did not automatically equate to equal treatment for every water license holder located in the watershed. Management in community watersheds was heavily regulated and administered by the public agencies of the Ministry of Forests and the Ministry of Environment, which implemented directives from guiding documents such as the Community Watershed Guidebook and the Interior Watershed Assessment Guidebook. From the moment that a forest company began the process of developing IWAP's in community watersheds, officials with the MOF and MOE directed forest licensees in preparing roundtables with "affected community water purveyors", not all water purveyors in a watershed. Direction given by the governing agencies always defined affected water licensees or purveyors to be those that acted in the capacity of a community system such as Spud Hill or the RRID water systems (directed to water systems with substantial investments in infrastructure or water treatment). This could explain why Spud Hill was delineated as a separate community watershed, nested within the larger Ladybird Watershed from the mapping provided by the Ministry of Environment (circa 1997). If every water license holder in a community watershed was to be afforded the same treatment (as inferred in the FPB findings), then this would have negated the need to have a separate community watershed delineated within the boundaries of a larger watershed, as every license holder would have had to be treated the same.

Under these types of planning directives, non-organized water purveyors such as single use water licensees defaulted to regulations specific to individual domestic water sources as located outside of community watersheds. The understanding of the day was that by default of being encompassed in a community watershed, a single user water license holder would benefit from the planning activities carried out by the "community water purveyors" (i.e., higher levels of planning, higher levels of riparian protection, etc.); however, they would only be afforded the same treatment as a "domestic watershed license holder" outside of a community watershed.

Again, assuming a strict interpretation of the stated regulation would infer that every water license holder in a community watershed should have been treated equally, not just in 48 hour notification, but in all aspects of management in a community watershed including the roundtable groups of the watershed committees. If one is to assume this to be true, then a

double standard is created, whereby a single use water licensee in a community watershed is afforded higher standards than those located in defined domestic watersheds.

These nuances of legislative interpretation can sometimes lead to outcomes that may be different from what the policymakers originally intended. This is made even more acute when the governing agencies tasked with providing direction to the private sector are also confused or misled by the intent of the legislation. The obvious range of interpretation about this matter (both within and outside of government) leads us to question the original intent of the policymakers

Finally, while it is understood that the FPB prepared this audit report within the scope of their jurisdiction (i.e. primarily crown land forest practices with a focus on water quality conservation at the source), one cannot truly understand the complexities of managing in consumptive use watersheds without delving into the deeper seated issues that affect water quality. The scope of the review may mislead individuals into believing that water quality lives and dies on the actions of forest companies. In fact, all users in a watershed operate under legislative burdens and bear equivalent levels of responsibility for protecting water quality including mining interests, recreation (commercial and free use), private land owners, regional districts, government ministries, and water licensees themselves. Source protection is one facet of managing water quality. The other facet depends upon effective infrastructure to treat and deliver clean water to all users of the resource. As well, the audit does not explore whether there are more effective solutions for protecting water quality than the existing system of licensing greater numbers of single use water licenses and resource use tenures on a shrinking crown landbase. A full scope review of current public policies and practices of all responsible parties may be a more effective means by which to judge the health of a community watershed and could provide more meaningful recommendations for the general public.

## Atco Lumber Ltd

Within Section 2.1 there should be a description of the IWAP methodology ie. the level of communications, review, and establishment of watershed boundaries for assessment purposes

Within Section 3.1 there should be a more elaborate description of the two IWAP's previously performed and the remedial measures taken (this does not need to be expansive, but the present short paragraph does not provide anyone reviewing the findings to have a clear appreciation of the breadth of works and interactions undertaken)

There should be statements about the ministries getting the task of Water Quality Objectives establishment completed. Delays in this work simply complicate an already complicated water resource management

The response to the audit report by Kalesnikoff reflects accurately the sentiments of Atco as well. In very concise terms the major issue is the vagueness of the requirement of the FPPR

Section 84, which states "At least 48 hours before commencement of road construction or deactivation in a community watershed, a person must notify affected water licensees or affected water purveyors."

The key problem is the interpretation of the word "affected": MOFR and Atco Lumber Ltd. have both interpreted affected in this CW as the RRID and Upper Pass Creek community group. Through two comprehensive IWAP exercises, numerous Ladybird Technical Committee meetings (involving Atco, Kalesnikoff , RRID, Upper Pass Creek representatives, MoF and MoE), field trips, and remedial works projects it is interesting the issue of inadequate 48 hour notice has never surfaced. During the IWAP process the very initial step is to define stakeholders and watershed boundaries for the assessment. It is again interesting that the watershed bounds were defined were using the Upper Pass Creek as the POI and that individual water licensees were not stakeholders in the process

In summary, it is frustrating to find such a fine line of legal interpretation appearing so significant following the years of closely and effectively working with RRID, MOFR, and MOE on our operational practices within the Ladybird Watershed

As a final comment, the fact that the RRID representatives had to leave our closing audit meeting early due to sediment created on private land along Pass Creek really delivers a strong message about the complexity of watershed management

## Joint submission from Atco and Kalesnikoff

Re: 48 hour Notification to Domestic Water Users for Road Works within the Norns CW

In regards to the Ladybird-Norns Pilot Audit replies from Atco and Kalesnikoff the most contentious issue is the FPB interpretation on the 48 hour notification requirement for Domestic Water (DW) license holders within a Community Watershed (CW) for road construction and deactivation works.

We disagree that legislation should require that domestic water license holders, who have intakes within the confines of a Community Watershed boundary, have the benefit of a 48 hour notice on road work activities.

However, if there is a need for some additional notice for Domestic Water License holders located within a Community Watershed we feel a more practical requirement would be:

"Within a community watershed boundary all potentially affected Domestic Water license holders will receive a minimum of one notification annually of road construction or deactivation activities. This notice will be sent out prior to commencement of road works."

There is no intention to send road construction/deactivation notifications to water licence holders outside the bounds of the designated Community Watershed.

## Ministry of Environment

The *Water Act* has it's origins in the 19th century and is admittedly outdated. Currently the *Water Act* does not allow for the consideration of water quality or environmental issues in decision making. I know this is something that MOE will be addressing in their "Strategy for Water in BC."

MOE has been a partner with Atco's water quality monitoring program since 1998. We have not been participating financially since 1999 or 2000 due to cuts to our FRBC program, but we've been continuing to contribute in-kind by providing guidance and technical support

There should be some distinction between the role of the different MOE divisions. The Environmental Stewardship Division (Fish, Wildlife and Habitat) has historically reviewed, commented on and assessed compliance with FDPs. The new WSD is the new lead agency for water in BC, however IHA is the lead agency for drinking water. MoE provides technical support to IHA, water purveyors and other agencies on source water protection issues (part of which is to develop WQOs), administers the Water Act and now our Minister can order water management plans to be developed

MOE is actively involved in source water protection. Our ministry has been actively involved in FRBC water quality monitoring programs since 1996. We have been directly involved with Norns Creek monitoring program since 1998. We have a draft WQO document expressly directed at source water quality and have been talking to Licensees about continued and somewhat expanded monitoring that we hope to partner on. This information will be used to assess WQO attainment, assist the purveyor with planning for their improved water supply infrastructure, and in conjunction with IHA, we are trying to implement Drinking Water Teams as per the MOU under the Drinking Water Action Plan to address conflicts and issues that arise as a result of land use practices in community and domestic source water supply areas.

In "Audit Approach", last paragraph under water sampling—be a bit careful here extrapolating the WQ results observed during one specific short duration rainfall period to some conclusion about overall impacts. Qualify your statements.

In 2.1 it sounds like MOFR have almost no responsibility for WQ. MOFR is a signatory of the MOU on Source Water Protection under the BC Drinking Water Action Plan, so they have obligations under that to protect WQ. Could also mention that MOFR are still responsible for compliance and enforcement of FRPA and FPC, and are also responsible for conducting effectiveness evaluation audits, including those for WQ, under FREP.

It should be clear somewhere in this report that Government has recognized the need for a provincial strategy for managing water. As a result, the Ministry of Environment has, as part of its 2006-07 Service Plan, been working on a water strategy for BC—the general public should hear more about this very soon. This strategic plan for water is a priority action for government

and, in our Service Plan is the # 1 goal and objective (a key priority) for our ministry. The Ministry's new Water Stewardship Division was established primarily as the means to achieve better water mgmt in BC. Once this strategy has Cabinet approval, it will go out for broad consultation, probably this summer, and implementation could begin this fall or early in 2007. Check out the Ministry Service Plan—all the wording is there and there is a sincere push on this initiative.

Since your samples only represent WQ at the time of the audit, you can say "no impacts" is true for the time represented by those samples. Unless you look at weekly or monthly samples, or continuous turbidity data over several years, it is not really appropriate to draw conclusion for periods other than what you directly sampled. So, if you feel comfortable to make this conclusion outside the audit period, you should qualify your statement re: impact.

Regarding the sentence in 4.1 "The audit sample results for Norns Creek are consistent with water sampling results collected in that system between 1998 and 2003 (refer to Appendix A for graphs showing 2001-2003 annual turbidity results)." Here's where you've drawn the link between your WQ sample results and historic data to establish that there is little or no impact as a result of logging practices. To be rigorous, you should be sure the data comparisons are "apples with apples". If it is more general you should explain what and how comparisons were made, and qualify conclusions based on possible limitations of that comparison. The 2002 and 2003 graphs show a couple of spikes outside of freshet, greater than one NTU—are they related to impacts from logging? If so does that mean that practices don't always protect WQ? Just trying to point out the need to qualify your results.

Re 5.2, in the opinion of FPB is there sufficient monitoring of WQ and quantity? You don't actually say. Are there some recommendations here for agencies and/or water suppliers? In 6.2 you say there is insufficient water quantity data being collected – recommendations?

One of the most important aspects of your report to our ministry are the comments, implications and recommendations regarding mgmt of water in BC. As you may know this past fall, in recognition of the current lack of adequate leadership in water mgmt, our Minister was charged with the duty of developing a BC Strategy for Water. This task is talked about in the Premier's Great Goals and delivery is embedded in our Ministry's Service Plan. You should at least mention this in the report because this strategy, and the formation of the Water Stewardship Division, is supposed to address the current lack of co-ordinated water mgmt in the province. It may be worth looking at page 20 of the MOE Service Plan on the web. http://www.bcbudget.gov.bc.ca/2006/sp/env/env.pdf

Looking forward to seeing your recommendations regarding adequacy of current water quality and quantity (WQ/Q) monitoring and assessment as it relates to forest licensees, the various agencies and water suppliers. From our ministry's perspective, we are moving in a direction to facilitate and provide technical support for these activities, and where possible develop partnerships to conduct WQ/Q monitoring programs as resources allow and priorities dictate.

## Interior Health Authority

The water sampling was done on a specific date and time which reflected the conditions at the time of sampling. This data is not sufficient to conclude that the water quality met Canadian standards for treated drinking water. The samples reflect the turbidity result at the time of sampling. The *Guidelines for Canadian Drinking Water Quality* reflect many other parameters before treated drinking water quality is considered to be of acceptable quality and safety. Water sampling over a period of time would be required to associate forest activity impacts on water quality. Forest practices in these watersheds may have minimal impact on water quality however this reflects more of an observation made during the inspection of the watershed and the turbidity sample results taken at the time of inspection

The *Drinking Water Protection Act* (DWPA) provides drinking water officers, water suppliers and activity users in a watershed with responsibilities to ensure the protection of the water quality. The legislation provides that a person must ensure that their actions do not cause or result in a drinking water health hazard to a drinking water source. Drinking Water Officers have been granted powers to abate or prevent a drinking water health hazard from occurring. Drinking Water Officers may not be directly involved in the regulation of activity relating to source water however may be required to administer provisions of the DWPA to ensure source protection

## Ministry of Forests and Range

In the legislation section the requirements of FRPA and DWPA are accurately stated however we believe that a statement on the relationship between these two pieces of legislation would be of benefit. DWPA is a significant piece of legislation and has legal requirements on the management of the water resource however the report does not describe how, or if, it is brought into the requirements of FRPA which is eventually the primary legislation to be followed by forest operations. This has a bearing on the relationship amongst the agencies, licensees and forest operators regarding mandate and responsibility for directions and compliance reporting

In the reports compliance findings the statement is made that "the legislation requires licensees to give at least 48 hours notice of road construction or deactivation work to affected water licensees and water suppliers." It has been the districts' understanding and interpretation of Section 84 of the Forest Practices and Planning regulation that the notice of activity was to be made to the primary community water purveyor. This is reflected in our cutting permit and road permit letters to the licensees operating in the community watersheds. The specific direction we provide in our documents is "…the licensee must notify water licensees, or their representatives…at least 48 hours before the start…"

Furthermore, upon checking with MOFR Resource Tenures and Engineering Branch staff who participated in the drafting of the legislation, it was clearly the intent of the legislation to have the contact made only to those water purveyors in the watershed. The more strict interpretation of Section 84 as presented in your report would have to be communicated and implemented as district procedure. We appreciate that all of the water users in the watershed have an interest in

the forest operation activities; this interest is satisfied with a very detailed and thorough district managers instructions for the referral of operational plans.

In the reports comments on sub-criterion 1.2 we accept your presumption on the meaning of the FRPA drinking water objective however we suggest that you add the statement that the "…downstream treatment capabilities must be to a reasonable or appropriate standard." Too often there are complaints of the impact of operations on water quality when the very basic treatment structures are not in place

In the reports response to Criterion 2 regarding communication the comment is made that the government agencies may not have a good understanding of what is expected of them. The report correctly states that our roles have significantly changed by the introduction of the results based regime in legislation but it does not adequately comment on this regime being at least part of the reason "lack of understanding." The regime has taken us out of the direct involvement however there is still a desire and expectation of the water users and to an extent the licensees that we will continue some level of operational involvement. This leads to the type of uncertainty that leads to poor understanding and communication.

[i] In 2003, the Board conducted a pilot audit of stream riparian management in the Chilliwack Forest District and a pilot audit of forest soil conservation in the Mackenzie Forest District. In 2004, the Board audited visual quality management in the Campbell River Forest District and did a second riparian audit on a licensee in the Kootenay Lake Forest District.

[ii] Most of the *Forest Practices Code of British Columbia Act* (the Code) was repealed on January 31, 2004, and replaced with the *Forest and Range Practices Act* (FRPA). The transitional provisions of FRPA say that the Code continues to apply to forest practices carried out under a forest development plan. This continues until there is an approved forest stewardship plan, at which point, the requirements of FRPA apply. Therefore, although FRPA has been in effect during the audit period, the audited legislated forest practices requirements were requirements of the Code.

[iii] An affected water licence would be one where the intake draws water that could be impacted by the applicable road construction or deactivation.

[iv] Under DWPA, a water supplier is a person in charge of a water supply system that serves more than one single-family residence.

[v] Springer Creek Forest Products Ltd. became a company in April 2005. Formerly, Slocan Forest Products and then Canfor owned its forest agreements and mill. For the purpose of this audit report, any activities subject to audit that were conducted by previous owners between April 1, 2003, and April 2005 are attributed to Springer Creek Forest Products.

[vi] The FRPA Resource Evaluation Program, also known as FREP, is a long term commitment by government to determine if forest and range policies and practices in British Columbia are achieving government's objectives for FRPA resource values and to implement continuous improvement of forest management. The Ministry of Forests and Range runs the program with assistance from the Ministry of Environment.

[vii] Turbidity is a measure of the relative clarity of water. More specifically, it is a measure of the scattering effect of light on particles suspended in water. The unit of measurement is an NTU or nephelometric turbidity unit. The Canadian drinking water guidelines call for a turbidity of less than one NTU for drinking water.

[viii] A forest development plan is an operational plan that provides the public and government agencies with information about the location of proposed roads and cutblocks for harvesting timber over a period of at least five years. The plan must specify measures that will be carried out to protect certain forest resources prescribed by regulation. It must also be consistent with any higher level plans. Site-specific plans are required to be consistent with the forest development plan.

[ix] FRPA Sections 191 and 192.

[x] Under the *Forest and Range Practices Act* and its regulations, all major tenure holders (companies with logging rights on Crown land) and the timber sales manager, BC Timber Sales, must prepare a forest stewardship plan. Government must approve this plan before forestry operations take place. The forest stewardship plan is a cornerstone of the results-based approach governing forest practices under the Act. In their plans, tenure holders must state explicitly how they will address government objectives for key forest values, such as soils and wildlife. The forest stewardship plan may be in place for up to five years and may be extended for a further five years while its counterpart under the Code, the forest development plan, could be in place for only up to two years. The new plans are intended to encourage longer-term planning, contribute to sound forest management, reduce paperwork and encourage innovation.

[xi] For a full discussion of water quality objectives in the regulatory environment, refer to the Board's 2003 report, "A Special Report On The Use Of Water Quality Objectives Under Forest Practices Legislation: Lessons for the Future."

[xii] Ministry of Environment Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments - Overview Report 1988.

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